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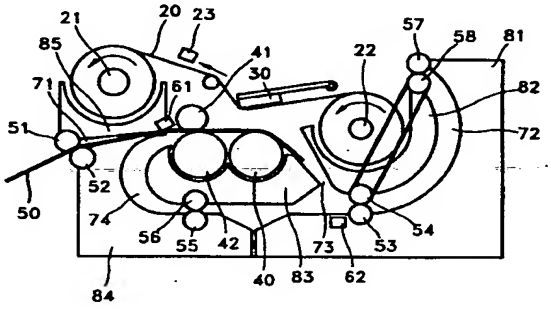
(54) Thermal transcription printer

(57) An improved thermal-transcription printer capable of printing on both sides of a sheet of paper (50) includes first and second transferring rollers (53, 54), first and second guide paths (73, 74), and a paper-ejection path (72). The paper (50) is turned over for printing on the reverse side, after the front is completely printed.

FIG.3



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Description

The present invention relates to a thermal-transcription printer, and more particularly, though not exclusively, to a thermal-transcription printer which can print on both sides of a sheet of paper.

As shown in Figure 1, a thermal-transcription printer is generally comprised of a platen drum 11 which is rotated by a predetermined driving source (not shown), an ink ribbon 20 provided over the platen drum 11, wound in one direction, a pair of paper-supply rollers 13 for supplying a sheet of paper 14 between the platen drum 11 and ink ribbon 20, a capstan roller 15 and a pinch roller 16 for transferring while pressing the paper sheet 14, and a recording head 10 installed to move up and down to press or release the ink ribbon 20. The ink ribbon 20 consists of a series of sections sequentially coated with pigments of yellow Y, magenta M, cyan Y and black B, as shown in Figure 2.

The operation of the above thermal-transcription printer will now be described.

First, the paper sheet 14 is transferred from a supply cassette 12 toward the platen drum 11 by the paper-supply rollers 13. When the paper sheet 14 reaches a printing position, the recording head 10 moves down and thermally presses the ink ribbon 20. Here, only the first color (e.g., yellow) of the ink ribbon 20 is printed.

With the yellow printing thus completed, the paper sheet 14 is retreated by the reverse rotation of the capstan roller 15, the recording head 10 moves up, and the ink ribbon 20 rolls to place the section for the next color (e.g., magenta) in the printing position. When the paper sheet 14 stops in the printing position again, the recording head 10 moves down and thermally presses the ink ribbon 20. Thus, the magenta color is printed on the transferred paper 14.

The cyan and black colors are superimposed on the paper 14 by repeating the above procedure.

In the above conventional thermal-transcription printer, printing is restricted to one side of the paper. Therefore, to print on the other side, the same sheet should be fed again. As a result, the conventional thermal-transcription printer exhibits slowed printing and presents an inconvenience to the user.

It is an aim of preferred embodiments of the present invention is to provide a thermal-transcription printer for printing on both sides of a sheet of paper.

According to the present invention, there is provided a thermal-transcription printer comprising: a platen drum rotated by a first driving source; a recording head positioned over said platen drum, having means for emitting heat in a predetermined pattern, and installed so as to move up and down so that said heat emitting means is brought into contact with said platen drum; an ink ribbon coated with sequential sections of predetermined color pigments and transferred between said recording head and said platen drum; first transferring means for laterally transferring a sheet of paper between said ink ribbon and said platen drum; second transferring means for repositioning the sheet of paper after one side of the paper sheet is completely printed and for laterally transferring the paper sheet between said platen drum and said ink ribbon for printing on an opposite side of the paper sheet; and means for ejecting the paper sheet.

Suitably, said first transferring means comprises: a capstan roller disposed at one side of said platen drum and rotated by a second driving source; a pinch roller for friction-rotating with said capstan roller; a pair of first transferring rollers installed at the other side of said platen drum and rotated by a third driving source; a paper-supply path for guiding said paper sheet between said capstan roller and said pinch roller; a first guide path for guiding said paper sheet from said platen drum, and at the rear of which said first transferring rollers are installed; and a second guide path having one end which opens toward said capstan roller and the other end which communicates with said first guide path.

Suitably, said second transferring means comprises a paper-ejection path for ejecting said paper sheet from said capstan roller and said platen drum; a second guide path having one end which communicates with said paper-ejection path and the other which opens toward said capstan roller and said pinch roller; and a pair of second transferring rollers installed in said second guide path and rotated by a fourth driving source.

Suitably, the printer further comprises a first sensor installed in front of said capstan roller, for sensing either end of said paper sheet; and a second sensor installed in front of said first transferring rollers, for sensing the trailing edge of said paper.

According to a second aspect of the present invention, there is provided a thermal-transcription printer arrangement comprising a paper feed, a thermal-transcription printer head, a first guide path and a second guide path, first means for driving a paper sheet through the first drive path, means for driving the paper sheet through the second guide path, and means for ejecting the paper sheet, wherein the first guide path passes the printer head, the first and second guide paths intersect and in which the paper sheet passes the printer head with the reverse side towards the printer head via the second guide path as compared with the first guide path.

According to a third aspect of the present invention, there is provided a method of operating a thermal-transcription printer, which method comprises the steps of: printing one side of a sheet of paper, reversing the orientation of the sheet of paper relative to a printer head and printing the other side of the sheet of paper.

Suitably, the arrangement or method further comprises any one or more of the features or steps of the accompanying description, claims, abstract and/or drawings in any combination.

A thermal-transcription printer according to the present invention enables both sides of a sheet of paper to be printed by turning the paper over through the first and second guide paths and the paper-ejection path.

The present invention will become more apparent by describing in detail, by way of example only, a preferred embodiment thereof with reference to the attached drawings in which:

Figure 1 is a schematic view of a conventional thermal-transcription printer;

Figure 2 is a schematic view of an ink ribbon; and

Figures 3-10 are operational diagrams of a thermal-transcription printer according to the present invention.

Figure 3 schematically illustrates a thermal-transcription printer according to the present invention. Reference numeral 40 denotes a platen drum rotated by a first driving source (not shown). A recording head 30 is installed over the platen drum 40 so as to move up and down, and is provided with a heat emitting device (not shown) for emitting heat in a predetermined pattern. The recording head 30 descends to establish contact between the heat emitting device and platen drum 40.

An ink ribbon 20 as described with reference to Figure 2 is provided over the platen drum 40 to be transferred between the recording drum 30 and the platen drum 40.

There are further provided first transferring means for transferring a sheet of paper 50 back and forth between the ink ribbon 20 and platen drum 40, and second transferring means for transferring the paper sheet 50, which is turned over after the printing of one side is completed, back and forth between the platen drum 40 and ink ribbon 20.

The first transferring means has a capstan roller 41 provided at one (rear) side of the platen drum 40 and rotated by a second driving source (not shown), a pinch roller 42 for friction-rotating with the capstan roller 41, a pair of first transferring rollers 53 and 54 installed at the other (front) side of the platen drum 40 and rotated by a third driving source (not shown), a paper-supply path 71 for guiding the paper sheet 50 between the capstan roller 41 and pinch roller 42, a first guide path 73 for guiding the paper from the platen drum 40 and having the first transferring rollers 53 and 54 at the rear thereof, and a second guide path 74 having one end which opens toward the capstan roller 41 and the other end which communicates with the first guide path 73.

The second transferring means comprises a paper-ejection path 72 for ejecting the paper sheet 50 from the capstan roller 41 and platen drum 40 through the first guide path 73 and first transferring rollers 53 and 54, the second guide path 74, and a pair of second transferring rollers 55 and 56 installed in the second guide path 74 and rotated by a fourth driving source (not shown).

The paper-supply and paper-ejection paths 71 and 72 and the first and second guide paths 73 and 74 are formed by first to fifth guide blocks 81-85.

Meanwhile, a first sensor 61 for sensing either edge of the paper sheet 50 is installed adjacent to the capstan roller 41, and a second sensor 62 for sensing only the trailing edge of the paper sheet 50 is installed adjacent to the first transferring rollers 53 and 54.

Reference numeral 23 denotes a color sensor for sensing the location of each of the various colors along the ink ribbon 20.

The operation of the thermal-transcription printer as constituted above will be described.

As shown in Figure 3, the paper sheet 50 is supplied between a pair of supply rollers 51 and 52 installed in front of the paper-supply path 71. When the first sensor 61 senses the leading edge of the paper sheet 50, the capstan roller 41 and first transferring roller 54 rotate counterclockwise. Thus, the paper sheet 50 is transferred along the first guide path 73 and paper-ejection path 72. While the paper sheet 50 is being transferred, the recording head 30 remains over the platen drum 40 and the ink ribbon 20 remains inactive.

As shown in Figure 4, when the first sensor 61 senses the trailing edge of the paper sheet 50, the capstan roller 41 and first transferring roller 54 stop rotating. Then, the ink ribbon 20 rolls from a supply reel 22 to a take-up reel 21. When the color sensor 23 senses the leading edge of the yellow color Y during the rolling of the ink ribbon 20, the transfer of the ink ribbon stops. Then, the recording head 30 descends and thermally presses the ink ribbon 20.

In the above state, as shown in Figure 5, the paper sheet 50 is retreated while the capstan roller 41 and transferring roller 55 rotate clockwise. Here, the paper sheet 50 is transferred between the capstan roller 41 and pinch roller 42, along the second guide path 74 and between the second transferring rollers 55 and 56.

When the yellow color Y is completely printed on the paper sheet 50, the recording head 50 moves up and the transfer of the ink ribbon 20 stops, as shown in Figure 6. Then, the capstan roller 41 and second transferring roller 55 rotate counterclockwise again, and thus the paper sheet 50 is transferred clockwise. Here, the paper sheet 50 reaches the paper-ejection path 72 through the first guide path 73. When the first sensor 61 senses again the trailing edge of the paper sheet 50, the capstan roller 41 stops, thereby stopping the transfer of the paper sheet. Then, the ink ribbon 20 rolls, and when the color sensor 23 senses the leading edge of the magenta color M, the transfer of the ink ribbon stops.

Thereafter, the magenta, cyan and black colors are superimposed by printing on the paper sheet 50 while the paper sheet is manipulated in the same manner as during the yellow printing.

When one side of the paper sheet 50 is completely printed, the sheet is transferred toward the paper-ejection path 72, as shown in Figure 7. Here, the transfer of the paper sheet 50 is performed until its trailing edge reaches the second transferring rollers 53 and 54, by the rotation of the second transferring rollers 53 and 54 and ejection rollers 57 and 58. When the second sensor 62 senses the trailing edge of the paper sheet 50, its

transfer stops.

Then, as shown in Figure 8, the paper sheet 50 is transferred clockwise by reversely rotating the first and second transferring rollers 53 & 54 and 55 & 56. Here, the paper sheet 50 is turned over while it passes through the second transferring rollers 55 and 56, second guide path 74, capstan roller 41 and first guide path 73. When the first sensor 61 senses the trailing edge of the paper sheet 50, its transfer stops.

Then, the ink ribbon 20 rolls, and when the color sensor 23 senses the leading edge of the yellow color Y, the transfer of the paper sheet 50 stops. Thereafter, the recording head 30 descends to thermally press the ink ribbon 20. Then, while the capstan roller 41 and second transferring roller 55 rotate clockwise, the paper sheet 50 is transferred backward. Thus, the yellow color Y is printed on the rear side of the paper sheet 50.

When the yellow color Y is completely printed, the capstan roller 41 is driven counterclockwise, and thus the paper sheet 50 is transferred to the initial printing position as shown in Figure 8.

Then, the ink ribbon 20 is transferred, and when the color sensor 23 senses the leading edge of the magenta M, the transfer of the ink ribbon 20 stops. Thereafter, the recording head 30 moves down and thermally presses the ink ribbon 20.

In the above state, as shown in Figure 9, the paper sheet 50 is transferred and the magenta color M is printed in the same manner as the yellow color Y was printed, and thus superimposed on the paper. Then, the cyan color C and black color B are each printed on the paper sheet 50 in the order described above.

After the rear side of the paper sheet 50 is printed, as shown in Figure 10, the capstan roller 41, first transferring rollers 53 and 54 and ejection rollers 57 and 58 are driven, thereby ejecting the paper sheet.

As described above, the thermal-transcription printer according to the present invention can print on both sides of a sheet of paper.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. A thermal-transcription printer comprising:

   a platen drum (40) rotated by a first driving source;

   a recording head (30) positioned over said platen drum (40), having means for emitting heat in a predetermined pattern, and installed so as to move up and down so that said heat emitting means is brought into contact with said platen drum (40);

   an ink ribbon (20) coated with sequential sections of predetermined color pigments and transferred between said recording head (30) and said platen drum (40);

   first transferring means (41, 42, 53, 54, 71, 73, 74) for laterally transferring a sheet of paper (50) between said ink ribbon (20) and said platen drum (40);

   second transferring means (72, 55, 56) for repositioning the sheet of paper after one side of the paper sheet (50) is completely printed and for laterally transferring the paper sheet (50) between said platen drum (40) and said ink ribbon (20) for printing on an opposite side of the paper sheet; and

   means (41, 53, 54, 57, 58) for ejecting said paper sheet (50).

2. A thermal-transcription printer as claimed in claim 1, wherein said first transferring means (41, 42, 53, 54, 71 73, 74) comprises:

   a capstan roller (41) disposed at one side of said platen drum (40) and rotated by a second driving source;

   a pinch roller (42) for friction-rotating with said capstan roller (41);

   a pair of first transferring rollers (53, 54) installed at the other side of said platen drum (40) and rotated by a third driving source;

   a paper-supply path (71) for guiding said paper sheet (50) between said capstan roller (41) and

said pinch roller (42);

a first guide path (73) for guiding said paper sheet (50) from said platen drum (40), and at the rear of which said first transferring rollers (53, 54) are installed; and

a second guide path (74) having one end which opens toward said capstan roller (41) and the other end which communicates with said first guide path (73).

3. A thermal-transcription printer as claimed in claim 1 or claim 2, wherein said second transferring means (72, 55, 56) comprises:

a paper-ejection path (72) for ejecting said paper sheet (50) from said capstan roller (41) and said platen drum (40);

a second guide path (74) having one end which communicates with said paper-ejection path (72) and the other which opens toward said capstan roller (41) and said pinch roller (41); and

a pair of second transferring rollers (55, 56) installed in said second guide path and rotated by a fourth driving source.

4. A thermal-transcription printer as claimed in claim 2 or claim 3, further comprising:

a first sensor (61) installed in front of said capstan roller (41), for sensing either end of said paper sheet (50); and

a second sensor (62) installed in front of said first transferring rollers (53, 54), for sensing the trailing edge of said paper (50).

5. A thermal-transcription printer arrangement comprising a paper feed (51, 52), a thermal-transcription printer head (30), a first guide path (71) and a second guide path (72), first means (41, 42, 53, 54) for driving a paper sheet (50) through the first drive path (71), second means (53, 54, 55, 56) for driving the paper sheet through the second guide path, and means for ejecting the paper sheet (41, 53, 54, 57, 58), wherein the first guide path (71) passes the printer head (30) the first and second guide paths (71, 72) intersect and in which the paper sheet (50) passes the printer head (30) with the reverse side towards the printer head (30) via the second guide path (72) as compared with the first guide path (71).

6. A method of operating a thermal-transcription printer, which method comprises the steps of:

printing one side of a sheet of paper (50), reversing the orientation of the sheet of paper (50) relative to a printer head (30), and

printing the other side of the sheet of paper (50).

7. A thermal-transcription printer arrangement or method according to Claim 5 or Claim 6, further comprising any one or more of the features or steps of the accompanying description, claims, abstract and/or drawings, in any combination.

FIG.1(PRIOR ART)

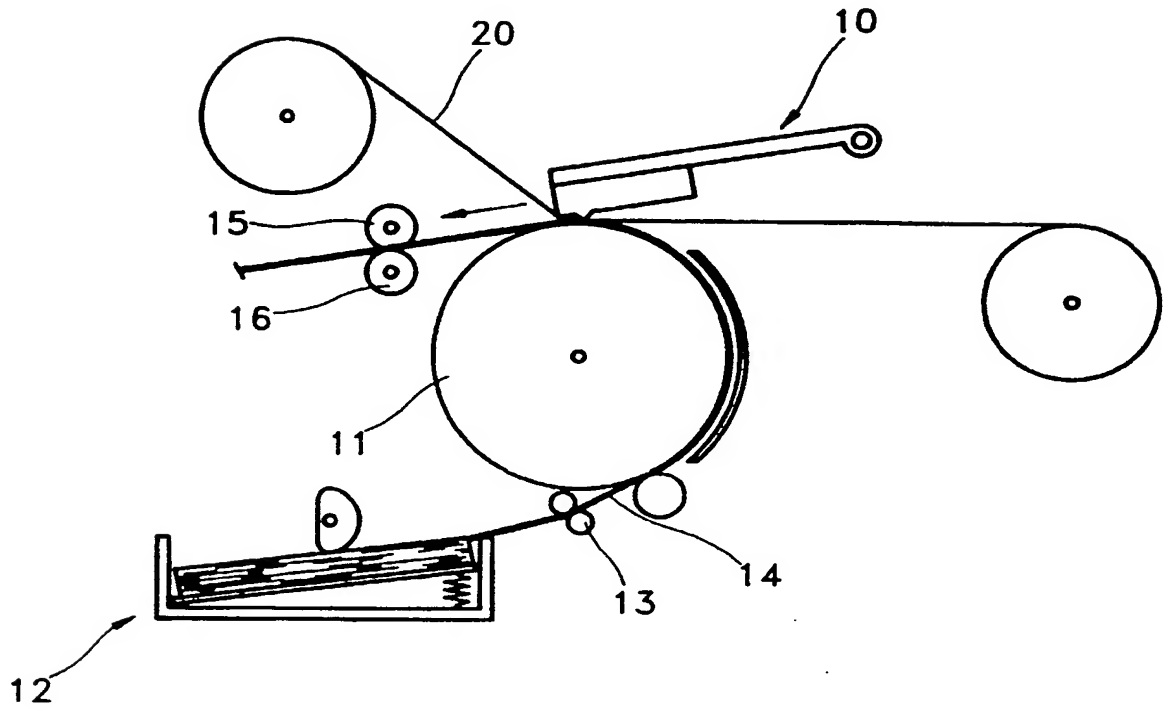


FIG.2

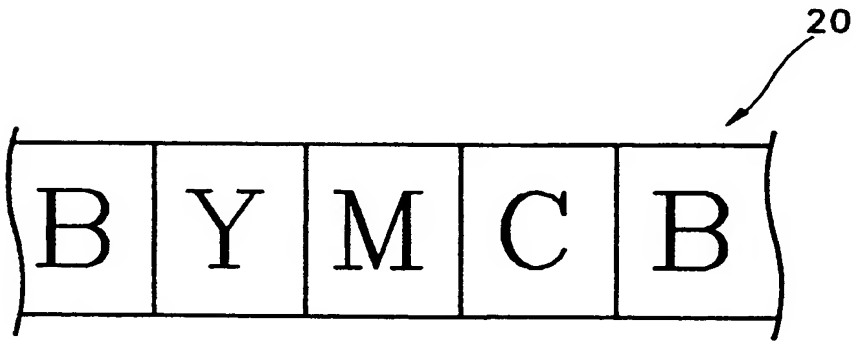


FIG.3

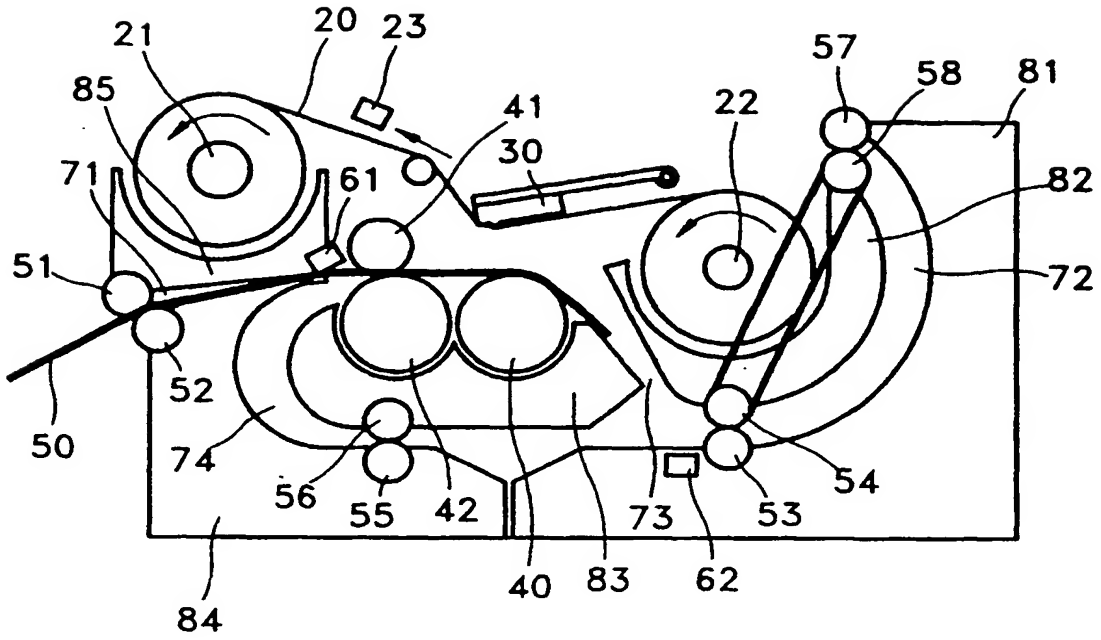


FIG.4

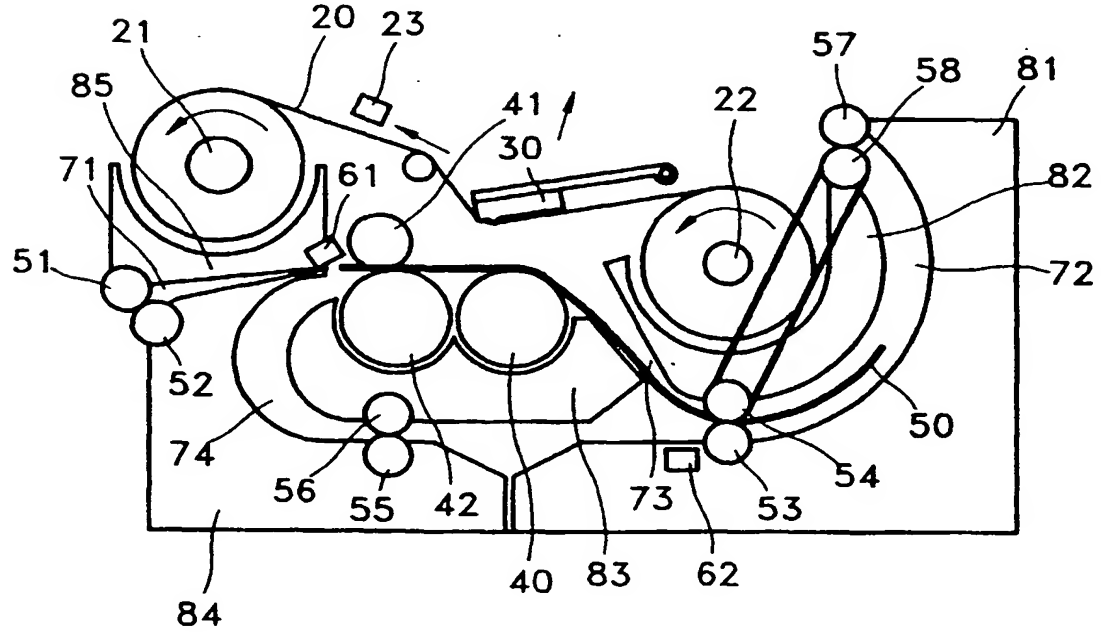


FIG.5

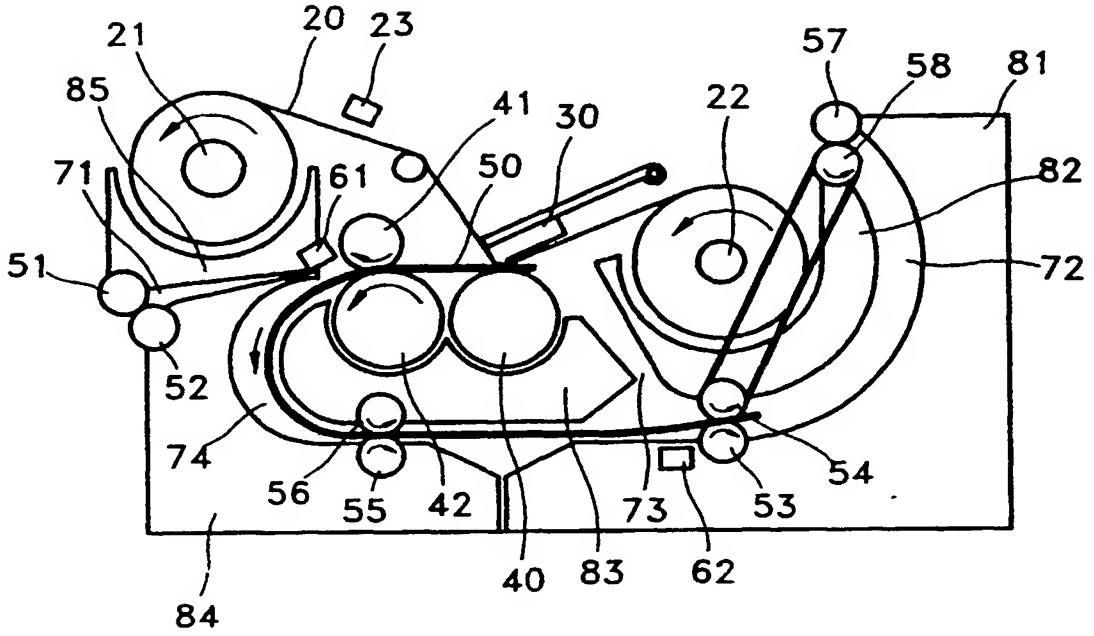


FIG.6

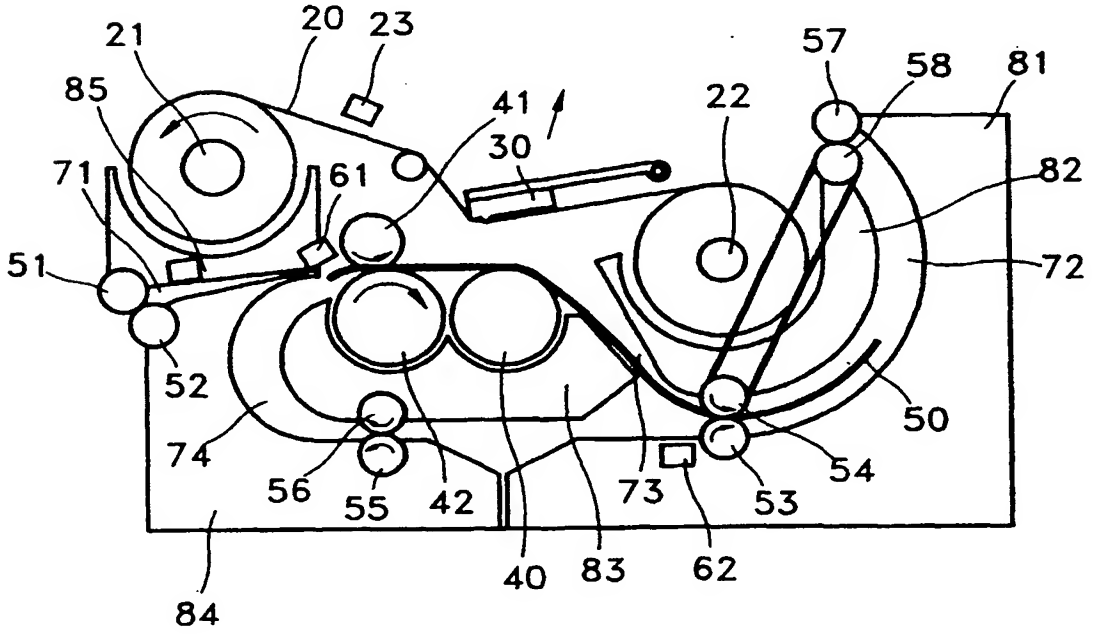


FIG.7

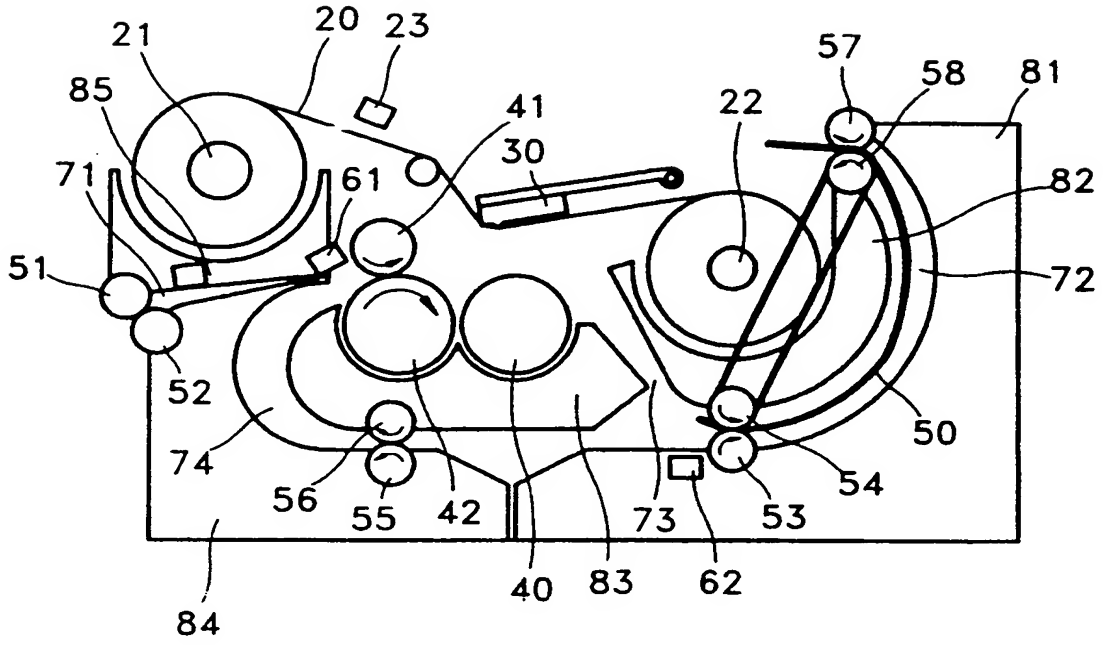


FIG.8

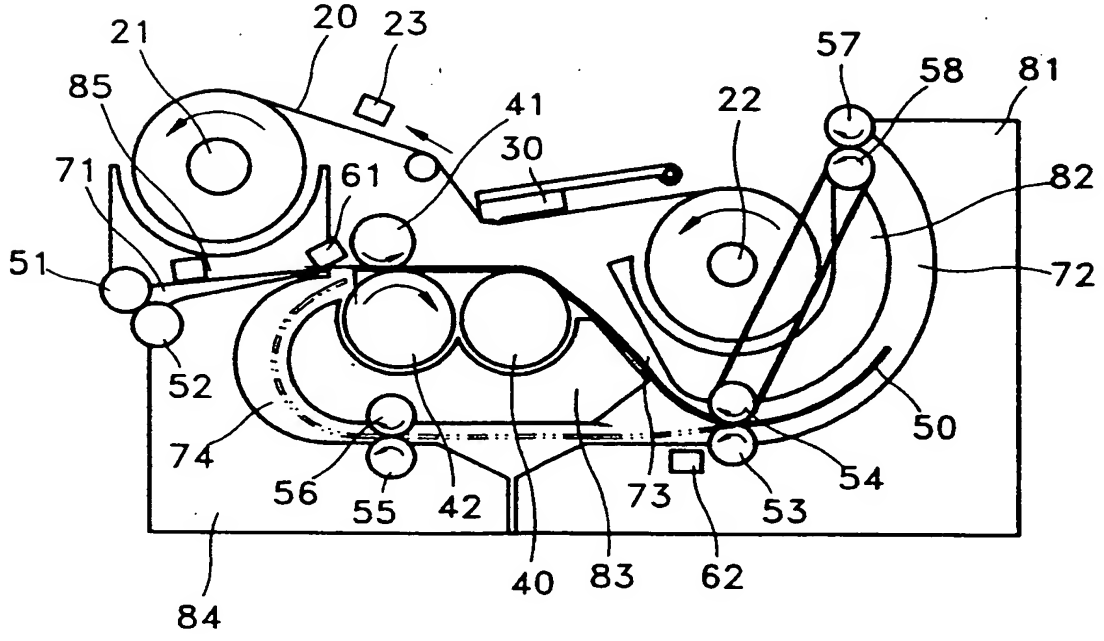


FIG.9

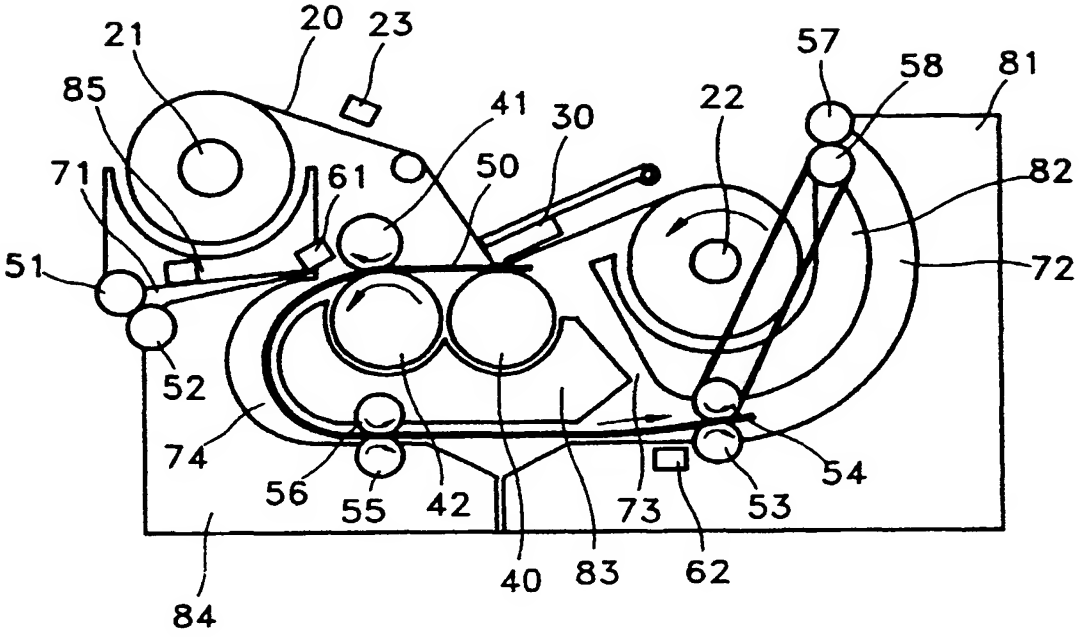
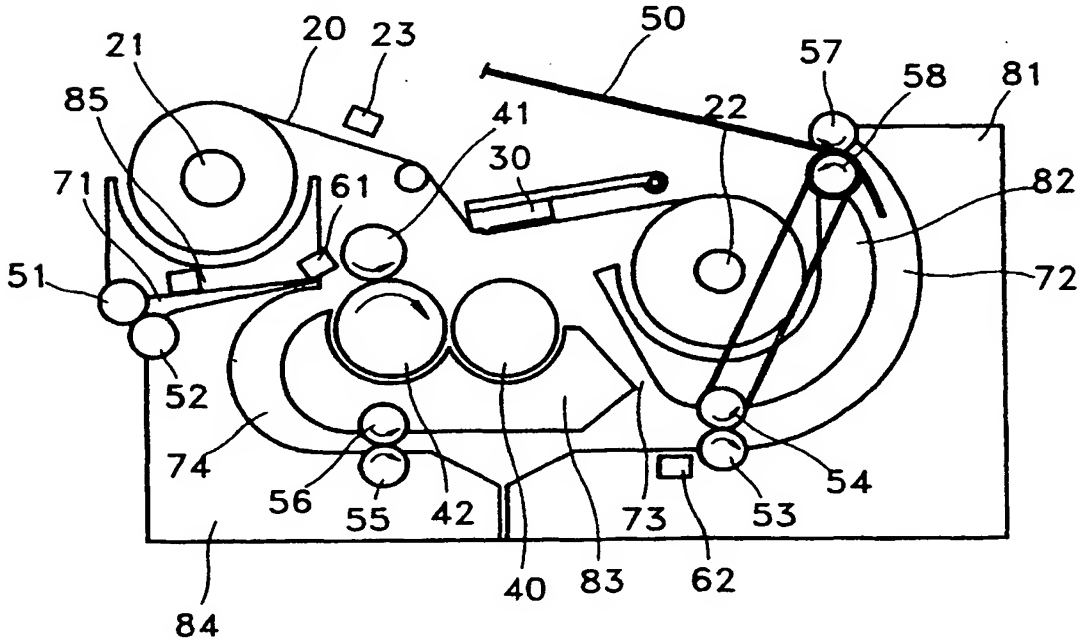


FIG.10



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EUROPEAN SEARCH REPORT

Application Number
EP 96 30 4713

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
Y A	US 4 932 798 A (KARDINAL ET AL.) * column 3, line 44 - column 6, line 45; figures 1-7 *	1,5-7 2,3	B41J3/60
Y	US 4 844 770 A (SHIRAISHI ET AL.) * column 2, line 14 - line 49 * * column 4, line 1 - column 6, line 29 * * column 7, line 22 - column 8, line 17; figures 2-7 *	1,5-7	
A	US 5 101 222 A (HAKKAKU) * column 6, line 6 - column 8, line 58; figure 1 *	1-3,5-7	
A	US 4 453 841 A (BOBICK ET AL.) * column 4, line 51 - column 8, line 34; figures 1-5B *	1-3,5-7	
A	US 5 452 959 A (OKA) * column 4, line 7 - column 7, line 42; figures 1-5 *	1,4-6	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6) B41J G03G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	16 May 1997	Rivero, C

CATEGORY OF CITED DOCUMENTS

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